Effect of the Surface Structure on the Electrochemical Behaviors of Electrodeposited Nickel

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Abstract

Electrochemical behaviors were measured on electrodeposited nickel with characteristic preferred orientations and the effect of the surface structure on the behaviors was discussed. In the anodic polarization, the electrodeposited nickel with the (211) orientation showed a lower initial dissolution potential than the deposits with the (210) or (110) orientation. In the cathodic polarization, the hydrogen evolution potential and the reduction current density at a constant potential were higher in the deposits with the (211) orientation than in the deposits with the other two orientations. It was, therefore, probable that the deposits with the (211) orientation was chemically most reactive among the nickel electrodeposits prepared under the present electrodepositing conditions. This was in good agreement with the result of electron microscopic observation by the author, that is, the deposits with the (211) orientation showed higher densities of corrosion trenches and holes than those with the other two orientations when the deposits were immersed into the corrosive solution for a constant period of time. The corrosion-suffered areas were twin boundaries or stacking faults which put in an appearance on the deposit surface, and a few crystal defects of these sorts were observed in the deposits having the (210) or (110) orientation, while many twin boundaries appeared in the electron micrographs of the deposits with the (211) orientation. From the above point of view, it was anticipated that there would be some difference in the density of these defects by the difference of orientations. It may therefore be predicted that the difference in the density of these defects has bearing upon the chemical reactivity of elctrodeposited nickel.

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